Carbon Cycling and Storage

Forests are in continual flux, emitting carbon into the atmosphere, removing carbon from the atmosphere, and storing carbon as biomass (sequestration). U.S. forests are a strong net carbon sink, often absorbing more carbon than they emit (Houghton 2003), (Heath et al. 2011), (U.S. Enviornmental Protection Agency 2015). Over the long term, through one or more cycles of disturbance and regrowth, net carbon storage is often zero because regrowth of trees recovers the carbon lost in the disturbance and decomposition of vegetation killed by the disturbance (Kashian et al. 2006), (Ryan et al. 2010), (McKinley et al. 2011). Within the National Forest System, forests are not converted to other land uses, and long-term net carbon storage is thus maintained.

In the most recent National Greenhouse Gas Inventory (EPA 2015), current annual forest (public and private ownership) carbon sequestration was reported at 211.5 teragrams (Tg) of carbon, offsetting approximately 11.6 percent of U.S. greenhouse gas emissions in 2013. Carbon stored in harvested wood products (HWP) contributes to the total forest carbon storage. Harvest treatments that generate long-lived wood products, such as lumber and furniture, transfer ecosystem carbon to the HWP carbon pool where carbon remains stored and doesn't contribute to net greenhouse gas emissions (U.S. Department of Agriculture 2017 DC.). In 2012, HWP carbon stocks represented roughly 2.16 percent of total forest carbon storage associated with national forests in the Northern Region ((U.S. Department of Agriculture 2015), Figure 1).

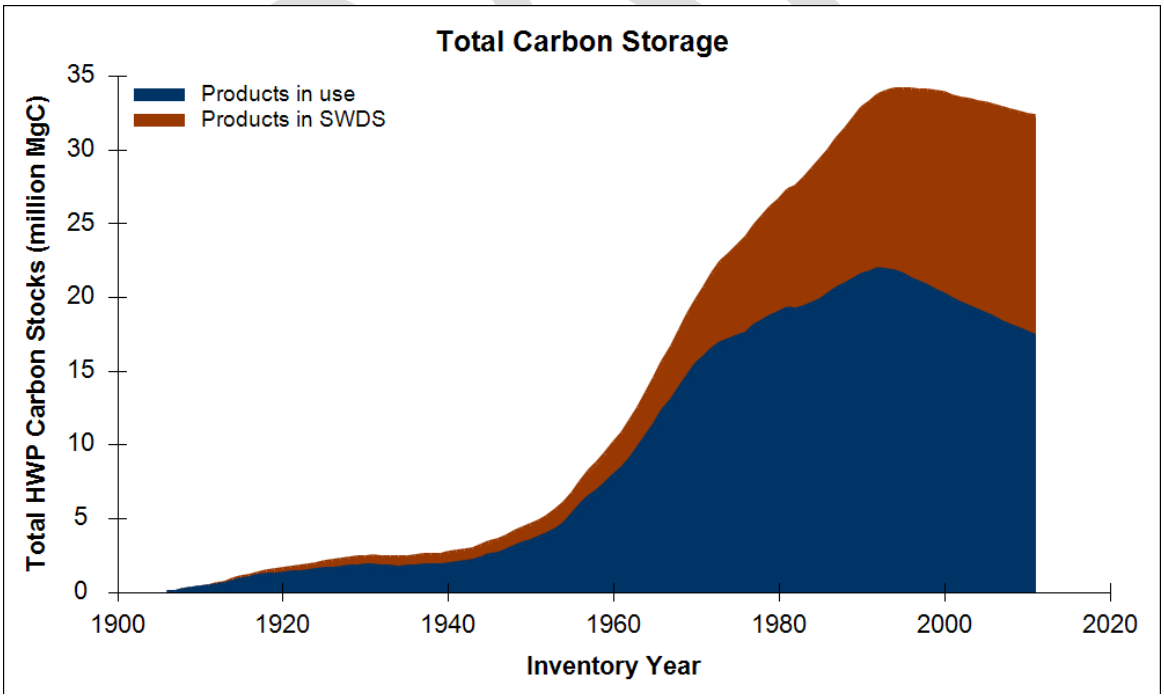

Figure 1. Cumulative total carbon stored in HWP manufactured from Northern Region timber using the IPCC/EPA approach. Carbon in HWP includes both products that are still in use and carbon stored at solid waste disposals sites (SWDS), including landfills and dumps (Stockmann et al.).

In the Northern Region, total forest carbon (forest ecosystem and harvested wood products) sequestration is estimated at 5.83 Tg carbon per year for the baseline period of 1990 to 2013 (USDA 2015). This represents roughly three percent of the total carbon sequestered by U.S. forests. Fire, insect, and disease disturbance have the greatest effect on carbon storage on national forest lands of the Northern Region, yet these typically affect < 1% of the total forested area each year (U.S. Department of Agriculture 2016 and D. Lederle, editors. Future of America's forests and rangelands: Update to the Forest Service 2010 Resources Plannning Act assessment USDA Forest Service, Research and Development, Washington, DC). Harvest affects an even smaller percentage of National Forest land, and does not have a long-term effect on carbon sequestration or storage because the land is not converted from forest to a different land use (Conant et al. 2007), (Ryan et al.), (McKinley et al. 2011).

Effects to Carbon Cycling

Summary: The proposed action would not have a measurable impact on carbon stocks in either the short or long term, because the area of treatment is a small fraction relative to regional and global carbon stocks.

Direct and Indirect Effects – Proposed Action

The acres proposed for regeneration harvest or intermediate treatments represent a miniscule area in the context of regional and global carbon stocks.

In the short term, the action alternative would remove some carbon currently stored in biomass by cutting trees. A substantial portion of this carbon would remain stored for a period of time in wood products (Depro et al. 2008), (U.S. Environmental Protection Agency 2010), reducing some of the carbon emitted through decomposition.

In the long term, the forest will regrow and accumulate carbon, thus acting as a carbon sink (Figure 2). In the action alternative, the proposed reforestation following regeneration harvesting would help ensure these forest stands return to a carbon sink as quickly as possible.

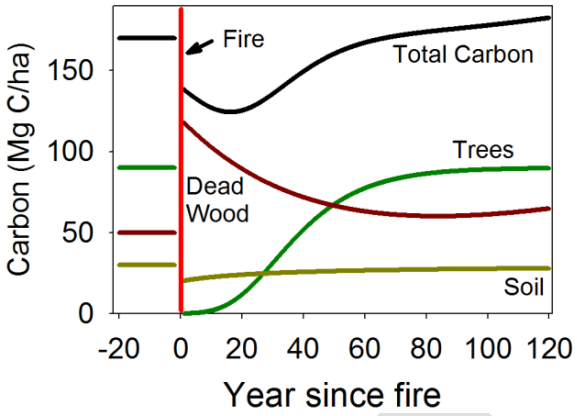

Figure 2. If a forest regenerates after a fire, or other disturbance, and the recovery is long enough, the forest will recover the carbon lost in the fire and in the decomposition of trees killed by the fire. This concept is illustrated here by showing carbon stored in forests as live trees, dead wood, and soil and how these pools change after fire. Model output is from an analysis published in Kashian et al. 2006.

Motorized equipment used during the action alternatives would emit a small quantity of greenhouse gases, but the impact that this would have on the atmospheric CO_2 concentration is impossible to determine. Timber harvest in any specific forest or stand will only affect the global CO_2 pool if harvest does not occur elsewhere in the world to supply the same world demand for timber (Wear and Murray 2004), (Gan and McCarl 2007), (Murray 2008).

Because the effects of forest management activities are so tiny, the carbon effects of the action alternative are indistinguishable from the effects of not taking the action.

Cumulative Effects

The entire Lolo National Forest represent a very small amount of the carbon stored in forests of the coterminous United States (Heath et al. 2011). Given the available data and tools (USDA 2015), (USDA 2016a), patterns and trends of carbon dynamics are best determined at larger scales and over long periods of time. Most national forests and forests in the U.S. on non-federal lands provide a carbon sink because of recovery from past practices that occurred early last century (USDA 2015). Harvesting (green trees) on western forest impacts about 0.09 percent per year of the total carbon on national forests. This project would affect a small percentage of the forest carbon stocks, and small fractional proportion of the total forest carbon stocks of the United States. The affected forest lands in this proposal would remain forests, not be converted to other land uses, and long-term forest services and benefits would be maintained. As such, there would be no cumulative effects associated with this project.

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